23K-0019

AI ASSIGNMENT

Date

Q2:

⇒ Population initialization:

$C_1 = [1, 3, 1, 2, 3, 2, 1]$

$C_2 = [3, 2, 2, 1, 1, 3, 2]$

$C_3 = [3, 3, 2, 2, 1, 1, 3]$

$C_4 = [1, 1, 2, 3, 1, 2, 2]$

$C_5 = [1, 3, 3, 1, 1, 1, 2]$

$C_6 = [2, 2, 3, 2, 1, 1, 3]$

⇒ Evaluate Fitness:

Chromosome	Task1	Task2	Task3	Task4	Task 5	Task 6	Task 7
C_1	5x10=50	8x16=128	4x8=32	7x10=70	6x12=72	3x8=24	9x11=99
C_2	45	112	36	84	84	30	108
C_3	45	128	36	70	84	27	117
C_4	50	120	36	91	84	24	108
C_5	~~50~~ 50	128	28	84	84	27	108
C_6	60	112	28	70	84	27	117

F1	F2	F3
5+4+9=18	7+3=10	8+6=14
7+6=13	8+4+9=21	5+3=8
6+3=9	4+7=11	5+8+9=22
5+8+6=19	4+3+9=16	7
5+7+6+3=21	9	8+4=12
6+3=9	5+8+7=20	4+9=13

C_1 = 50 + 128 + 32 + 70 + 72 + 24 + 99 = 475

C_2 = 499

C_3 = 507

C_4 = 513

C_5 = 509

C_6 = 498

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⇒ Roulette Wheel Selection:

	Inverse	Probability
C_1	1/475 = 0.002105	0.002105/0.012003 = 0.1753
C_2	1/499 = 0.002004	0.002004/0.012003 = 0.1669
C_3	0.001972	0.1643
C_4	0.001949	0.1624
C_5	0.001965	0.1637
C_6	0.002008	0.1673
Total =	0.012003	

⇒ C_1, C_2, and C_6 are favored due to their lowest costs.

⇒ Crossover:

Pair 1:

C_1 = [1, 3, 1, 2, 3, 2, 1] } Offspring 1 = [1, 3, 2, 1, 1, 3, 2]

C_2 = [3, 2, 2, 1, 1, 3, 2] } Offspring 2 = [3, 2, 1, 2, 3, 2, 1]

Pair 2:

C_1 = [1, 3, 1, 2, 3, 2, 1] } Offspring 3 = [1, 3, 1, 2, 1, 1, 3]

C_6 = [2, 2, 3, 2, 1, 1, 3] } Offspring 4 = [2, 2, 3, 2, 3, 2, 1]

Pair 3:

C_2 = [3, 2, 2, 1, 1, 3, 2] } O5 = [3, 2, 2, 1, 1, 1, 3]

C_6 = [2, 2, 3, 2, 1, 1, 3] } O6 = [2, 2, 3, 2, 1, 3, 2]

⇒ Mutation:

O1 = [1, 3, 2, 1, 1, 3, 2]

O2 = [3, 2, 1, 2, 2, 3, 1] {Swapped position 4 and 5}

O3 = [1, 1, 2, 1, 3, 3] {Swapped position 1 and 5}

O4 = [2, 2, 3, 2, 3, 2, 1]

O5 = [3, 2, 2, 1, 1, 1, 3]

O6 = [2, 2, 3, 2, 1, 3, 2]

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⇒ Fitness of new population:

	T1	T2	T3	T4	T5	T6	T7	F1	F2	F3
O_1	60	120	36	84	84	30	108	18	13	11
O_2	45	112	32	70	70	30	99	13	21	8
O_3	50	120	32	70	84	30	117	23	7	12
O_4	60	112	28	70	72	24	99	9	23	10
O_5	45	112	36	84	84	27	117	16	12	14
O_6	60	112	28	70	84	30	108	6	24	7

Fitness:

O_1 = 503

O_2 = 465

O_3 = 520

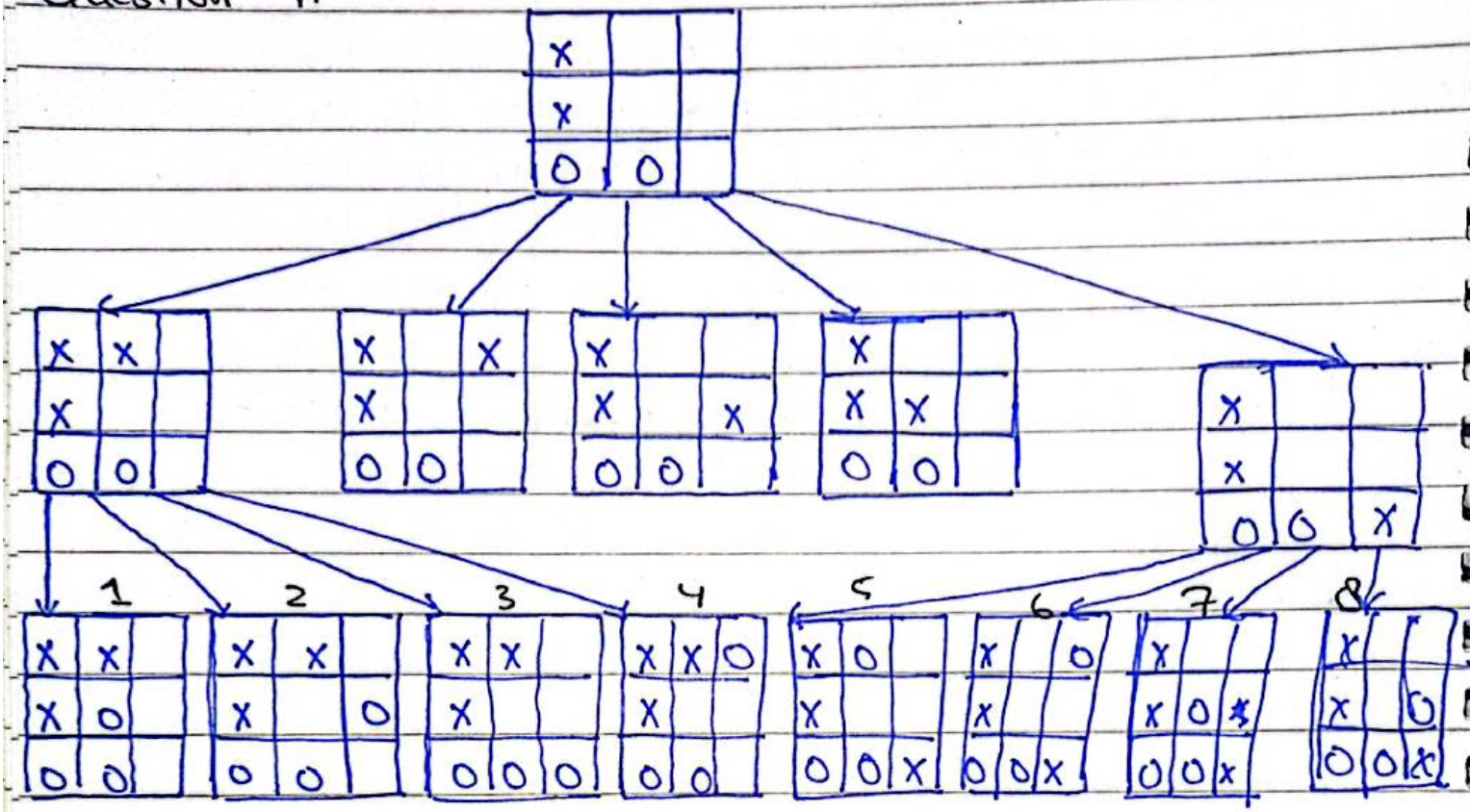
O_4 = 466

O_5 = 505

O_6 = 492

Date

Question 4:

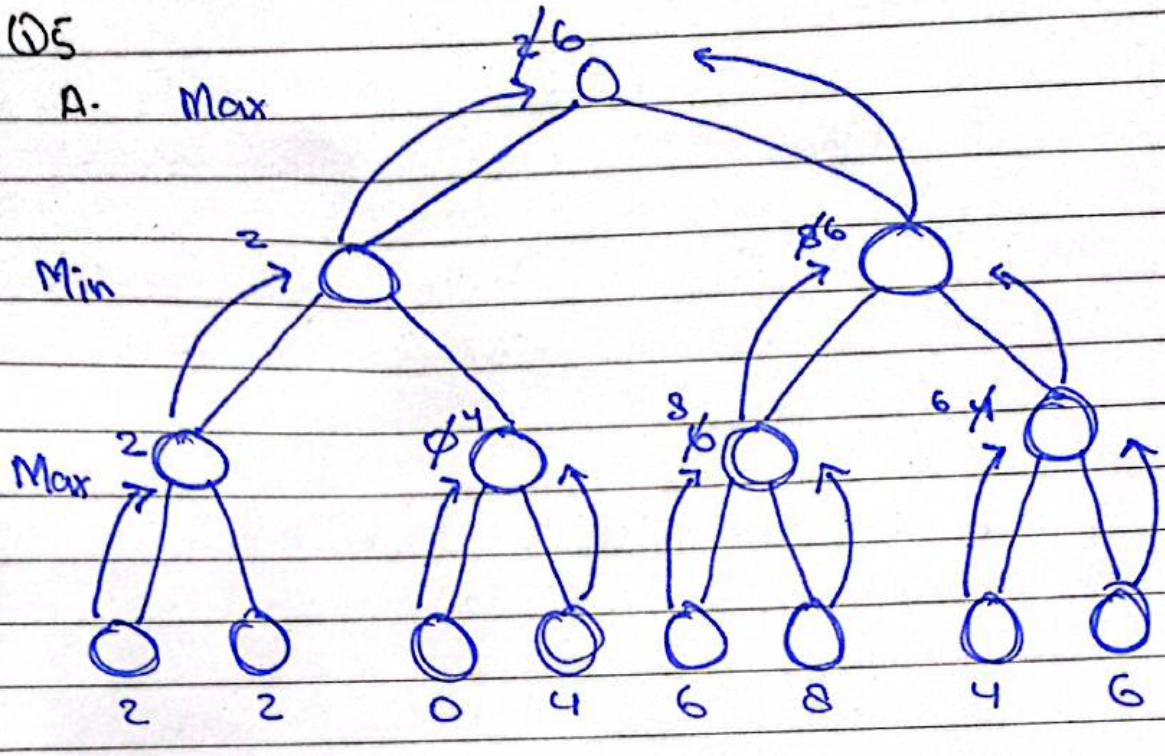


States	R1	R2	R3	C1	C2	C3	D1	D2	ΣR	ΣC	ΣD	Σ(R,C,D)
S1	100	0	-100	0	0	0	~~+100~~ 0	~~-100~~	0	~~+100~~ 0	-100	-100
S2	100	0	-100	0	0	-10	10	-10	0	-10	0	-10
S3	100	10	-1000	0	0	-10	0	-10	-890	-10	-10	-910
S4	0	10	-100	0	0	-10	10	-100	-90	-10	-90	-190
S5	0	10	0	0	-100	10	100	-10	+10	-90	90	+10
S6	0	10	0	0	-10	0	100	-100	10	-10	0	0
S7	10	0	0	~~+100~~ 0	-100	10	~~+100~~ 0	-100	~~-90~~ 10	~~+100~~ -90	-100	-180
S8	10	0	0	0	-10	0	100	-10	10	-10	90	90

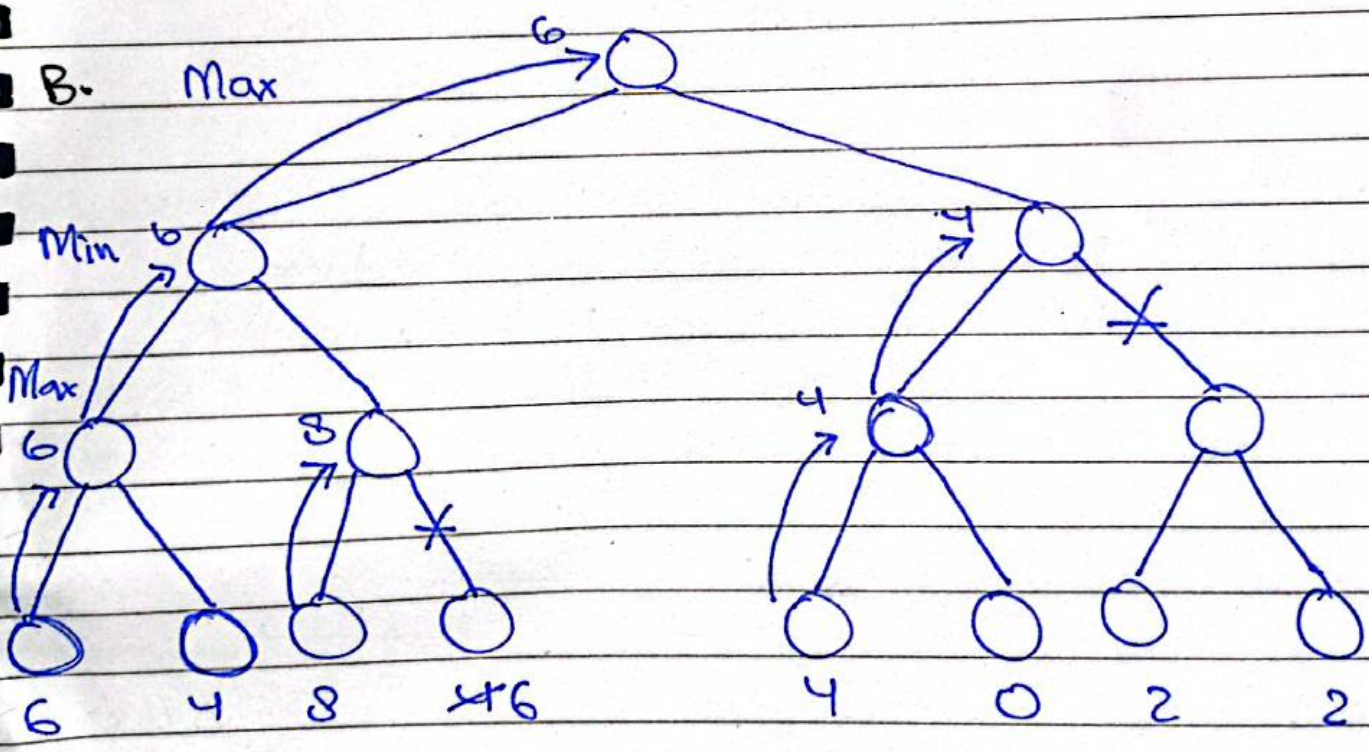
Date

Q5

A. Max



B. Max



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Q6 (a)

1. Max &: It is an AI-powered IDS which will defend the network from external attacks.

   Min: It is the attacker and its goal is to breach the network using various attacks.

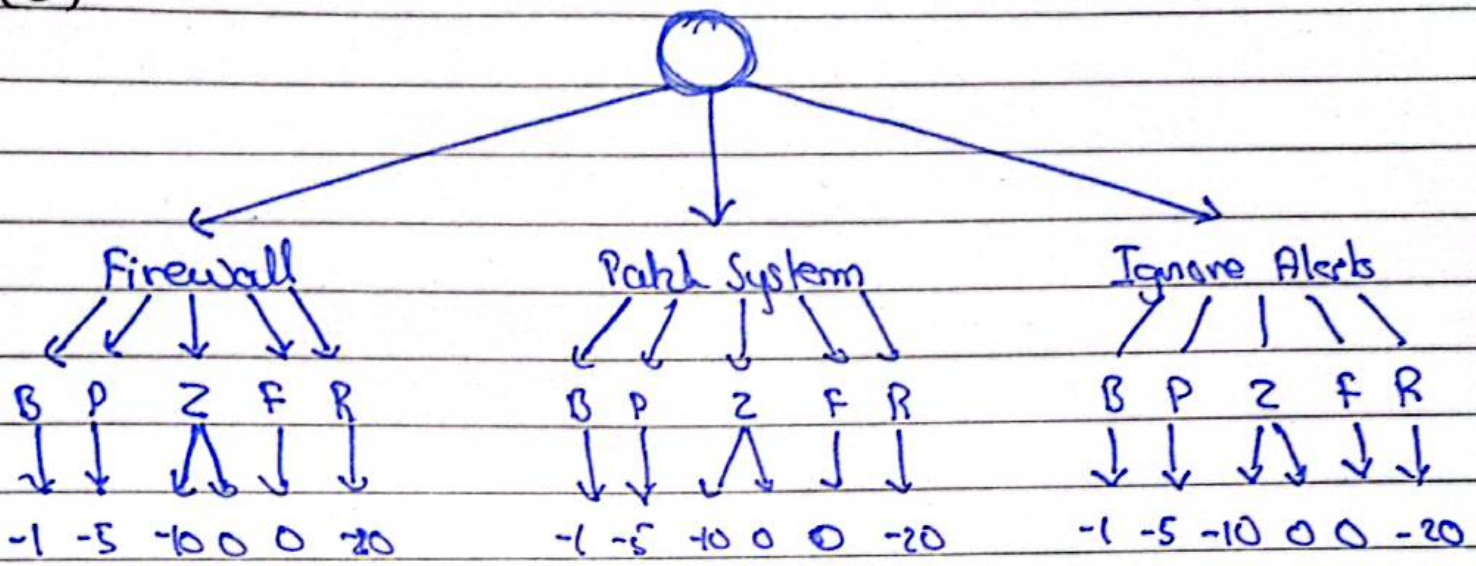
2. Max: It uses strategies such as, ~~deploying~~ implementing firewalls, patching systems to minimize the damage caused while maintaining costs.

   Min: It uses attacks like Brute-force, Phishing, zero-day exploit to maximize the damage caused to the network.

3. Attacks like zero-day exploit are probabilistic with 50% success rate. They introduce uncertainty, and the defender may need to shift the focus from worst case to average case based on probability.

Date

(b)


Firewall
Patch System
Ignore Alerts
B P Z F R
-1 -5 -10 0 0 -20
B P Z F R
-1 -5 -10 0 0 -20
B P Z F R
-1 -5 -10 0 0 -20